



RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

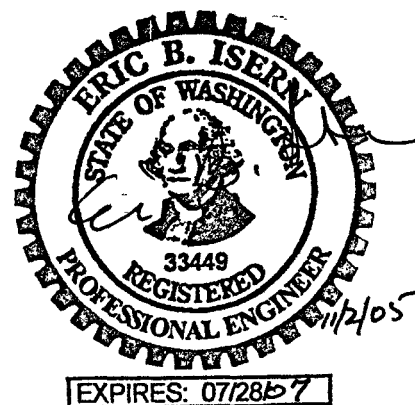
ENGINEERING SPECIFICATION

FOR

ISSUED BY
RPP-WTP PDC

Process Ejector / Educutor

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Rev
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Revision History

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0	Issued for Permitting Use
1	Issued for Permitting Use
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Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

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1 Scope

1.1 Project Description and Location

The River Protection Project – Waste Treatment and Immobilization Plant (RPP-WTP) is a complex of waste treatment facilities where the U.S. Department of Energy (DOE) Hanford Site tank waste will be put into stable glass form. The WTP Contractor will design, build, and startup the RPP-WTP pretreatment and vitrification facilities for the DOE Office of River Protection (ORP). The waste treatment facilities will pretreat and immobilize the low activity waste (LAW) and high level waste (HLW) currently stored in underground storage tanks at the Hanford Site.

The Hanford Site occupies an area of about 560 square miles and is located along the Columbia River, north of the city of Richland, Washington. The RPP-WTP Facility will be constructed at the east-end of the Hanford Site. The Counties of Benton, Franklin, and Grant surround the Hanford Site.

1.2 Equipment, Material, and Services Required

The Seller shall be responsible for analysis, design, fabrication, inspection, testing, special tools, handling instructions, packaging, storage instructions, and documentation for all equipment covered by this specification.

The Buyer will provide all required design inputs in the following documents: Specification, Material Requisition (MR), and Mechanical Data Sheets. It is further expected that the Seller will specify to the Buyer all additional design inputs and information that may be needed for the Seller to execute the provisions of this specification and the material requisition(s). The Seller shall advise the WTP of all known requirements and limitations regarding deployment and operation of ejector equipment.

Seller responsibilities for equipment and supporting documentation required under the provisions of this specification include, but are not limited to:

- 1.2.1 Development and Submittal of a schedule for Seller deliverables. Schedule dates will be negotiated and agreed to by authorized representatives of the Seller's and the Buyer's organizations.
- 1.2.2 The Seller shall submit Outline and Shop Detail drawings. These drawings shall include overall dimensions, mounting details, and fabrication details.
- 1.2.3 Fabrication and Delivery of Process Ejectors. The Process ejectors when delivered shall require only connection to the Buyer's piping system.
- 1.2.4 Testing of each model ejector/eductor to demonstrate that the device meets the Buyer approved acceptance criteria for performance.

1.2.5 The Seller shall prepare submit Installation, Operation, and Maintenance manuals for Buyer's review.

1.2.6 Provision of load weights, envelope dimensions, and external nozzle sizes for each Process ejector model that may be specified for inclusion in the WTP systems.

1.3 Work by Others

1.3.1 Shipping to job site

1.3.2 Material unloading and storage at job site

1.3.3 Installation labor

1.3.4 Interconnecting pipe work external to the equipment.

1.4 Definitions (Acronyms/Abbreviations)

1.4.1 ASME American Society of Mechanical Engineers

1.4.2 ASNT American Society of Nondestructive Testing

1.5 Safety/Quality Classifications

1.5.1 Quality Level (QL)

The quality level identifies the quality requirements to be applied to the equipment. The identified quality levels are QL-1, QL-2, QL-3, QL-4, AP (Air Permit), and CM (Commercial). Quality requirements are specifically defined on the associated Mechanical Data Sheets and supplier quality assurance program requirements data sheets.

1.5.2 Seismic Category (SC)

Specific requirements for each seismic category are defined in the reference specifications 24590-WTP-3PS-SS90-T0001 and 24590-WTP-3PS-FB01-T0001 (See section 2.5). The seismic category is identified on the Mechanical Data Sheet.

2 Applicable Documents

2.1 General

2.1.1 Work shall be done in accordance with the referenced codes, standards and documents listed below, which are an integral part of this specification.

2.1.2 When specific chapters, section, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or

paragraphs of the document are applicable and shall be applied. If a date or revision is not listed in section 2, the latest issue, including addenda, at the time of request for quote (RFQ) shall apply. The dates and revisions listed in section 2 shall apply to all subsequent references to codes and standards within this specification. When more than one code, standard, or referenced document covers the same topic, the requirements for all must be met with the most stringent governing.

2.2 Codes

- | | | |
|-------|-------------------|---|
| 2.2.1 | ASME B31.3 - 1996 | Process Piping |
| 2.2.2 | ASME NQA-1-1989 | Quality Assurance Program Requirements for Nuclear Facilities |

2.3 Industry Standards

- | | | |
|-------|----------------------|--|
| 2.3.1 | ASNT SNT-TC-1A, 1984 | Recommended Practice (including Non-Destructive Examination [NDE] personnel certification) |
|-------|----------------------|--|

2.4 Engineering Standards

Any additional engineering specifications and standards proposed for use by the Seller shall be reviewed by the Buyer prior to incorporation into the design.

2.5 Reference Documents/Drawings

- | | |
|-------------------------------------|---|
| 24590-WTP-3PS-SS90-T0001 | Engineering Seismic Qualification of Seismic Category I/II Equipment and Tanks |
| 24590-WTP-3PS-PS02-T0001 | Engineering Specification for Shop Fabrication of Piping |
| 24590-WTP-3PS-FB01-T0001 | Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks |
| 24590-WTP-3PS-G000-T0003 | Engineering Specification for Packaging, Handling and Storage Requirements |
| 24590-WTP-3PS-G000-TP002 | Engineering Specification for Positive Material Identification (PMI) for Positive Material Identification requirements. |
| 24590-WTP-3PS-G000-T0001
Program | General Specification Seller Quality Assurance Requirements |

3 Design Requirements

3.1 Basic Function

The basic ejector or eductor cycle is an operating media entrains a suction fluid in the suction chamber whereby a two phase flow regime is discharged. Ejectors or eductors have no moving parts; hence routine maintenance is not required.

Ejectors are employed in various pumping and heating applications, and use high pressure motive media to lift and pump a lower pressure water based hazardous (corrosive / erosive) fluid with suspended fines.

Eductors are used in various liquid heating and mixing applications. The intimate contact between the motive media and the process liquid makes the eductor ideal for mixing and heating application.

It is a requirement that process ejector components shall remain operable throughout the 40-year life of the WTP facility with zero maintenance access in the majority of ejector installations.

Process ejector connections in the piping system are butt welded.

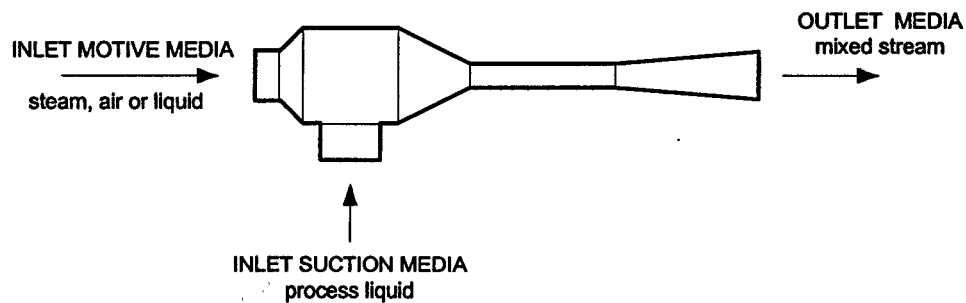


Figure 1 Inlet/Outlet Flow of the Process Ejector

3.2 Applications

Process ejectors and eductors are utilized in the WTP for liquid transfer, heating, and mixing in process vessels. The ejector and eductors are also used for sump emptying applications.

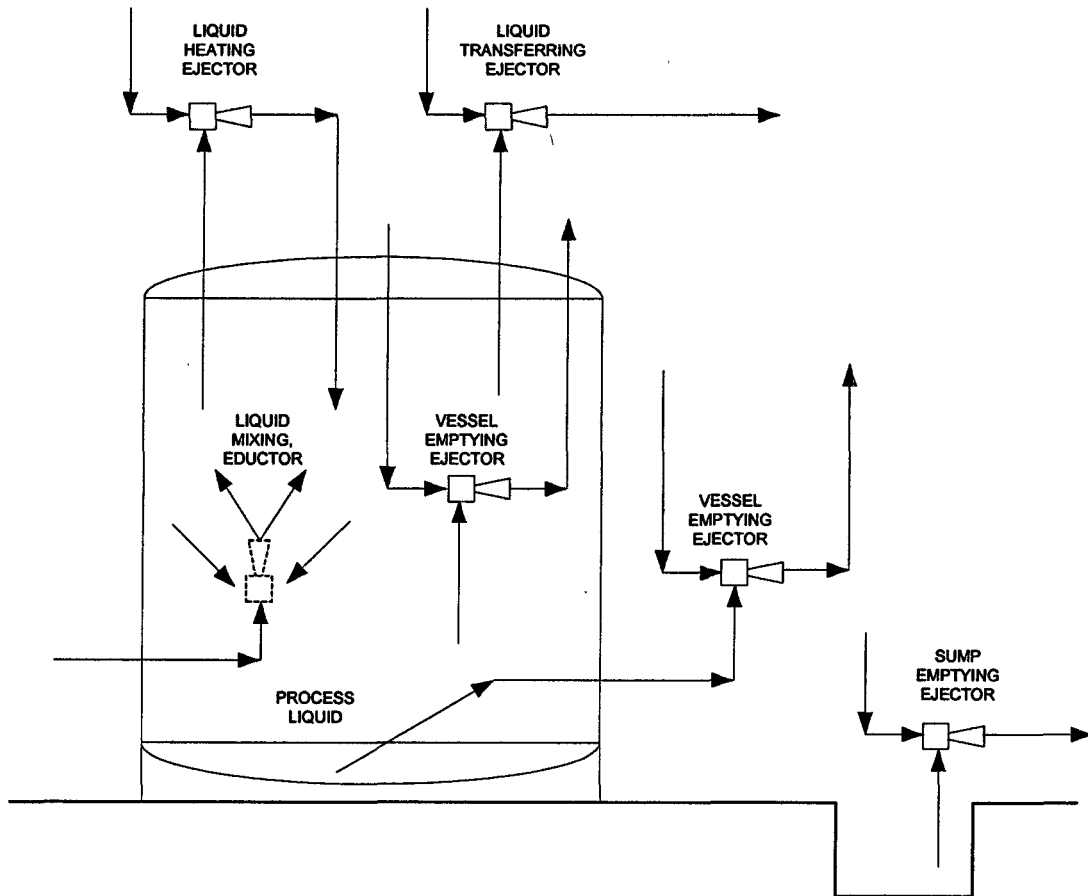


Figure 2 Applications of the process ejector

3.3 Performance

Requirements for each ejector or eductor are specified on Buyer provided Mechanical Data Sheets. Seller shall supply the ejector or eductor performance curves.

3.4 Design Conditions

- 3.4.1 Ejectors or eductors shall be designed in accordance with the Buyer's Mechanical Data Sheets.
- 3.4.2 The equipment and appurtenances will be used in a plant that has a design life of 40 years. The design life for the process ejectors and eductors shall also be 40 years.
- 3.4.3 All dimensions shall be U.S. Standard.
- 3.4.4 The end connection (butt weld, flange, or threaded) of the ejector or eductor will be specified on the ejector / eductor Mechanical Data Sheet and shall be prepared

for installation in the Buyer's piping systems. Components requiring jumper connections will be identified by the Buyer.

3.5 Environmental Conditions

3.5.1 The RPP-WTP is at approximately 700 feet above sea level.

3.5.2 Buyer will be provided the site and operating conditions of the ejector and eductor on the Mechanical Data Sheet.

3.5.3 Sound pressure levels around equipment shall be limited to maximum 85 dBA at 3 feet horizontal distance from noise producing components under any normal operating conditions. Seller to provide one data sheet specifying ejector or eductor noise level for each equipment model.

3.6 Mechanical Requirements

3.6.1 All materials and fabrication procedures shall be in accordance with the ejector / eductor Mechanical Data Sheet.

3.6.2 Ejectors and eductors fabricated by 100% butt-welded construction (including internals) shall be examined using 100% radiography for Quality Level (QL) components.

3.6.3 Radiography is not required for Commercial (CM) components.

3.7 Loadings

Inlet, suction and discharge pipe ends, which will be butt welded to project piping, shall meet seismic load capability requirements as defined in project specification 24590-WTP-3PS-SS90-T0001 or 24590-WTP-3PS-FB01-T0001, as applicable.

3.8 Corrosion and Erosion Allowance

Corrosion and erosion allowance is specified on the Mechanical Data Sheet and shall be applied to each surface exposed to process vapor or liquid. Ejectors and eductors internal to vessel shall have the specified corrosion allowance applied to both internal and external surfaces.

3.9 Electrical Requirements

N/A

3.10 Instrumentation and Control Requirements

N/A

3.11 Accessibility and Maintenance

- 3.11.1** Ejectors and eductors are not intended to require routine maintenance. Recommendations for system flushing and methods for recovery of blocked process ejectors shall be discussed in the Seller submitted operations and maintenance manuals (see section 1.2.5).
- 3.11.2** The Seller shall provide clear pre-operation maintenance and preservation instructions so as to keep the equipment in like new condition until ready for use.

4 Materials

4.1 Positive Material Identification

- 4.1.1** Refer to specification 24590-WTP-3PS-G000-TP002, Positive Material Identification (PMI), for positive material identification requirements.

4.2 Construction

- 4.2.1** The Seller shall furnish legible copies of mill test reports from the supplier of fabrication materials for all Process Ejectors / Eductors.
- 4.2.2** Construction material of the Process ejector will be specified on the Buyer's Mechanical Data Sheet.

4.3 Prohibited Materials

Materials containing aluminum, antimony, bronze, cadmium, copper, lead, teflon, tin, zinc, or other low melting point metals, their alloys, or materials containing bleachable halogens or sulfates, shall not be used in direct contact with stainless steel or nickel-based alloys.

4.4 Special Requirements

Where special requirements or restrictions are to be applied to the established items, these will be specified in accompanying contractual documentation. In the absence of such instructions, the manufacturers standard product shall be supplied as specified or as approved by the Buyer.

4.5 Storage of Materials

The Seller shall advise any special storage and preservation requirements.

5 Fabrication

The Seller shall obtain a written final design acceptance of all submitted procedures and drawings from the Buyer prior to the start of fabrication activities

5.1 Welding

- 5.1.1 Welding shall be performed by qualified welders per welding procedures prepared and qualified in accordance with ASME B31.3 - 1996.
- 5.1.2 Weld repair records shall be available for shop inspection and be submitted with the documentation package.
- 5.1.3 Weld procedures and procedure qualification records shall be submitted to the Buyer for review and acceptance prior to start of fabrication

5.2 Assembly

Preparations of field butt weld ends shall be in accordance with 24590-WTP-PW-P30T-00001.

5.3 Heat Treatment

N/A

6 Tests and Inspections

6.1 General

The Seller shall submit an inspection and test plan. A quality assurance manual with the relevant procedures for review and acceptance will also be submitted. The Buyer shall specify the following to be verified: the design requirements, the amount of inspection or testing, and the organizational element responsible for performing the inspection.

The seller shall be responsible for performing all tests and inspections.

6.2 Non-Destructive Examinations

The personnel performing non-destructive examinations or reviewing such tests results shall be certified to ASNT Standard SNT-TC-1A-1984.

- 6.2.1 Dye Penetrant Test (PT) or Radiographic Tests (RT) shall be performed on welds. Testing shall be performed and documented per the requirements of ASME B31.3 -1996. PT shall be performed on welds that cannot be RT'd. RT shall be performed on all accessible welds. Seller shall obtain Buyers agreement on welds not to be RT'd.
- 6.2.2 Hydrostatic testing shall be performed and documented on each completed process ejector and eductor per the requirements of ASME B31.3 - 1996.
- 6.2.3 A NDE and Hydrostatic report shall be submitted to document findings of all required examinations.

6.3 Shop Tests

6.3.1 Seller shall conduct and be responsible for both the Mechanical Test Procedure and Performance testing of each model ejector and eductor. Seller shall provide Buyer certified performance curves for each ejector and eductor model test.

6.3.2 Seller shall furnish all facilities necessary for the performance of such tests. In the event Seller's own facilities are not suitable for such tests, Seller shall advise Buyer and obtain permission for using alternative facilities.

6.4 Site Tests

Seller shall provide recommendations for operation of each process ejector system and shall be available for review and consultation of results from startup testing.

6.5 Control of Nonconforming Items

The control of nonconforming items is per specification 24590-WTP-3PS-G000-T0001.

7 Preparation for Shipment

7.1 Cleanliness

See instructions in the 24590-WTP-3PS-PS02-T0001 (Specification for Shop Fabrication of Piping) and 24590-WTP-3PS-G000-T0003 (Specification for Packaging, Handling, and Storage).

7.2 Painting

N/A

7.3 Tagging

Each Process ejector shall be legibly stamped or permanently tagged with its assigned Plant Item (equipment) Number. Where thin wall materials are used or where stamping is not permitted or advisable, the Seller shall submit for the Buyer's approval an alternate proposal for equipment identification.

7.4 Packaging

See instructions in 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling, and Storage.

7.5 Shipping Instructions

Shipping of ejector units to job site will be performed by the BNI.

8 Quality Assurance

8.1 General Requirements

- 8.1.1 Seller's Quality Assurance Program (QAP) requirements are specified in Buyer document # 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*.
- 8.1.2 Seller's QAP manual shall be submitted to the Buyer for review in accordance with Buyer document # 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*.
- 8.1.3 Seller's QAP, as a minimum, shall contain the requirements detailed in the Supplier Quality Assurance Program Requirements data sheet listed in section 2 of the MR.

8.2 Quality Related Components

- 8.2.1 Seller shall have in place a QAP meeting the requirements of ASME-NQA-1-1989, marked as applicable in Supplier Quality Assurance Program Requirements Data Sheet attached to the MR, and Buyer document # 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements*.
- 8.2.2 The successful bidder must pass a pre-award survey by the Buyer. Seller shall demonstrate that its quality program is in compliance with the procurement quality requirements listed in the Supplier Quality Assurance Program Requirements Data Sheet. Seller shall allow the Buyer, its agents, and DOE access to their facility and records pertaining to this purchase order for the purpose of QA audits and surveillance at mutually agreed times.
- 8.2.3 All items shall be manufactured in accordance with Seller's QAP that meets the requirements of ASME NQA-1-1989, and has been previously evaluated and accepted by the WTP Quality Assurance Organization.
- 8.2.4 Seller shall submit their QAP and work plan to the Buyer for review prior to commencement of work. The plan shall include documents and procedures to implement the work and include a matrix of essential QA elements cross referenced with the documents or procedures.

9 Configuration Management

9.1 General

Refer to Section 3 of the Material Requisition and forms G-321-E and G-321-V with their associated instructions for the required documents and submittals.